PATENT

Our Case No. D-5154

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Group Art Unit 1714
Stephen G. Baker et al.	Examiner: Katarzyna W. Lee
Serial No.: 09/847,182	
Filed: May 1, 2001	
For: CASTING SAND CORE AND EXPANSION CONTROL METHODS THEREFOR	

DECLARATION OF STEPHEN G. BAKER
PURSUANT TO 37 CFR §1.132

The Commissioner for Patents
Washington, DC 20231

Dear Sir:

Stephen G. Baker, being duly warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of any patent resulting from this patent application, declares that the statements set forth below are true and that all statements made on information and belief are believed to be true.

1. I am one of the co-inventors of the invention of this application.

2. I graduated from the School of Engineering and Technology of Purdue University in 1978, and currently hold the position of Senior Materials Engineer for the Indianapolis Casting Corporation in Indianapolis, Indiana. I have spent the last 28 years working in the casting industry and have presented and written numerous articles for technical and industry publications, such as Modern Casting.

3. The expansion of silica, in sand cores, has been a problem plaguing foundries for years. The rapid thermal expansion of the core sand during the casting process results in core cracking, and the molten metal enters the cracks, creating a thin fin of metal, referred to as a veining defect.

4. The foundry of the Indianapolis Casting Corporation has been using lake sand from Bridgman, Michigan, in its manufacture of sand cores. With the addition of 5% by weight (percentages by weight are based on sand weight) of Veinseal 14000, an anti-veining agent available from IGC Technologies, Inc. of Milwaukee, Wisconsin, to the lake sand, our foundry has produced internal combustion engine blocks and cylinder heads that were substantially free of unacceptable veins. A true copy of the Material Safety Data Sheet for the Veinseal 14000 anti-veining agent received from IGC Technologies, Inc. and used in the invention, showing its ingredients, is attached as Exhibit 1. (Material Safety Data Sheets published in the past by the Industrial Gypsum Company, Inc. for their VEINSEAL® 14000 anti-veining agents have omitted any reference to lithia-containing materials.) Because of environmental concerns, there was a danger that the lake sand in use would no longer be available. In addition, the cost of the lake sand in use increased substantially. It became advisable, therefore, to try to find a new effective sand core composition, and this problem fell within my responsibility as Senior Material Engineer.

5. My past experience and my study of available information on the veining problems created by the thermal expansion of sand cores taught me that experimentation is the only practical way to determine the effectiveness of different sand core compositions. An extensive experimental program was begun to find a new sand core composition that could be used in place of the sand core composition including lake sand. During the experimental program, which took several months, a number of sands and anti-veining agent combinations were tested by making test castings with the various sand core compositions. The testing included the use of silica sand, which is about 99% SiO_2, more expensive, and exhibits greater thermal expansion and veining than with the use of lake sand, which is only about 92% SiO_2. Our efforts to improve the thermal expansion characteristics of silica sand included the use of the Veinseal 14000 agent (Exhibit 1) that had been helpful with lake sand in amounts of 5% by weight and more, although the use of the silica sand with more than 5% by weight of Veinseal 14000 would increase the cost of the sand cores unacceptably.

6. In an effort to obtain an acceptable performance from sand cores formed with the use of silica sand, we were surprised to find that the combination of about 1% by weight of red iron oxide (Fe_2O_3) with as little as 2.5% by weight of the Veinseal 14000 anti-veining agent in a core sand composition including silica sand permitted castings without significant veining. Our testing established that substantially veinless castings could be achieved with core sand compositions including less than about 4% by weight of a lithia-containing material such as Veinseal 14000 and about 1% by weight of Fe_2O_3. Such core sand compositions include compositions including about 1% to about 3.5% by weight of a lithia-containing material such as Veinseal 14000, about 1% by weight Fe_2O_3, and the balance lake sand, and compositions including about 2.5% to about 3.5% by weight of a lithia-containing material such as Veinseal 14000, about 1% by weight Fe_2O_3 and the balance silica sand.

7. We discovered that the addition of as little as about 1% by weight of Fe_2O_3 to the core sand composition unexpectedly allowed the reduction of the amount of a lithia-containing material, such as Veinseal 14000, used as an anti-veining agent substantially below 5% by weight, by up to 50% below 5% by weight when used with silica sand, and by up to 70% below 5% by weight when used with lake sand, with castings at least as good as those previously obtained with the use of 5% by weight of the lithia-containing material Veinseal 14000.

8. The unexpected reduction in cost of materials alone, with the use of the invention claimed in the patent application, that is, by combining about 1% by weight of Fe_2O_3 with reduced quantities of the lithia-containing material Veinseal 14000, have been $300,000 to $400,000. I understand that because of the improved quality of the castings, there have been further savings as a result of reduced processing times and costs.

Dated: 2/18/03.

Stephen G. Baker

Material Safety Data Sheet

I. PRODUCT IDENTIFICATION

Manufacturer: IGC Technologies, Inc.
4039 W. Green Tree Road
Milwaukee, WI 53209

Regular Telephone: (414) 540-1300
(800) 877-8917

Emergency Telephone: (414) 482-7247

Trade name: WELDSEAL 14000

Synonyms: NONE

Chemical Formula: N/A

Chemical Family: N/A

C.A.S. No.: MIXTURE

II. INGREDIENTS

INGREDIENT EXPOSURE LIMITS

Material/Component	C.A.S. No.	WT%	TLV DATA PEL (OSHA)	TWA (ACGIH)	STEL (ACGIH)	Ceiling (OSHA)	IDLH (NIOSH)
SiO_2	14808-60-7	60-70%	1 mg/m³ Respirable Dust 3 mg/m³ Total Dust (ACGIH)				
Fe_3O_4	1309-38-2	10-20%	5 mg/m³ Respirable Dust 10 mg/m³ Total Dust				
Al_2O_3	1302-93-8	15-25%	5.0 mg/m³ Respirable Dust 10.0 mg/m³ Total Dust (ACGIH)				
TiO_2	13463-67-7	10-20%	5.0 mg/m³ Respirable Dust 10.0 mg/m³ Total Dust (ACGIH)				
LiO	12057-24-8	2-5%	Not Available				

III. PHYSICAL DATA

Appearance and Odor: Black, dry, fine material
pH: 7-9
Boiling Point: N/A

Density or Specific Gravity: 3.00-3.20
(H_2O=1)
Volatiles: N/A

Evaporation Rate: N/A
Butyl Acetate = 1

Vapor Density: N/A
Air = 1

Vapor Pressure: N/A

Freezing Point:
Melting Point: Incipient fusion at 1370° C.

Solubility in Water: Insoluble in water and common alkalis and acids; Soluble in Hydrofluoric acid.

IV. FIRE, EXPLOSION AND REACTIVITY DATA

Physical Hazard: N/A

Flash Point: N/A

Auto-Ignition Temperature: N/A

Flammable Limits in Air: N/A Upper: Lower:

Extinguishing Media: Water Fog

Special Fire Fighting Procedures: Wear self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode when fighting fires.

Unusual Fire & Explosion Hazards: When dispersed in air, can be highly flammable and may cause flash fires or ignite explosively if exposed to ignition sources such as open flames, sparks, smoking, etc.

Stability: Material is non-reactive and stable.

Conditions Contributing to Instability: None

Incompatibility: N/A

Conditions Considering to Hazardous Polymerization: Polymerization will not occur.

V. PRODUCT HEALTH HAZARD INFORMATION

Product Health Hazard: Material is irritant and toxic.

Product Exposure Limits: Should be treated as other products containing quartz. Prolonged and repeated exposure to dust may cause silicosis.

Routes of Exposure:

Eye Contact: W

Inhalation: W

Skin Contact: W

Ingestion:

Effects of Overexposure:

Acute Effects: Due to minor amounts of quartz workers should wear dust masks.

First Aid Procedures:

Eyes: Flush with water for at least 15 minutes with eyelids open.

Inhalation: Remove person to fresh air. Consult physician if necessary.

Skin: Wash well with soap and water.

Ingestion:

Other Toxicological Properties:

Carcinogenicity: See acute effects.

VI. DISPOSAL, SPILL OR LEAK PROCEDURES

Procedure for Release or Spill: Material should be cleaned up by methods appropriate for dusty materials and disposed of in compliance with federal, state, and local laws as they apply to non-hazardous materials.

Waste Disposal Method: Approved land disposal for non-toxic materials.

VII. PERSONAL PROTECTION INFORMATION

Ventilation Requirements: Circulate air and remove dust particles.

Specific Personal Protective Equipment:

Respirator: NIOSH/MSHA approved respirator is recommended when working in dusty conditions.

Eyes: Recommended when any possibility of dust particles entering the eyes exists.

Gloves: Recommended when contact is appreciable.

Other: General wear clean clothing is recommended.

VIII. HANDLING AND STORAGE

No specific measures necessary.